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ABSTRACT

The role of schools of public affairs and universities in meeting needs of public science agencies is discussed in this report. Following the purposes and methodology of this study, emphasis is placed on the manpower needs in science agencies of Federal, State, and local governments; university resources for science policy and administration; and combining resources to meet needs. Recommendations suggest that: (1) Well-trained personnel and effective management of Federal programs are vital to achieve the purposes of the public agencies. (2) The National Science Foundation (NSF) should be asked to consider the use of existing programs or the establishment of a new mechanism to strengthen university resources to help provide well-trained manpower and to conduct relevant research to improve the effectiveness of Federal, State, and local science agencies. (3) The director of the NSF should be requested to bring this need before appropriate Federal agencies so that they may be asked to use existing programs as appropriate. (4) The National Association of Schools of Public Affairs and Administration Committee on Science Policy and Administration jointly with the Council of State Governments should develop a specific grant proposal for a program designed to meet the needs outlined in this report and to submit this proposal to the NSF and other appropriate Federal agencies. (Author/MJM)

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Science Leadership for Tomorrow

The Role of Schools of Public Affairs and Universities in Meeting Needs of Public Science Agencies

Report of the NASPAA Committee on
Science Policy and Administration
With Support From The National Science Foundation

Albert H. Rosenthal
Robert F. Wilcox
Frank Marini

Any opinions, findings, conclusions or recommendations expressed herein are those of the authors and do not necessarily reflect the views of the National Science Foundation

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Preface

As a member of the NASPAA Executive Council for the past several years, I have been interested in learning of the active work of the Committee on Science Policy and Administration through the annual reports of the Chairman, Dr. Albert H. Rosenthal.

In my present role as President of NASPAA, as well as serving as President of an institution of higher learning, I am highly pleased that the Committee has conducted an extensive research, consultative, and discussion program during the past two years and has developed this concise and thoughtful Report.

The program proposed is sound and designed to meet an important need in a significant field. The following pages fully substantitate the need for attention and support by federal, state, and local public science agencies to achieve increased university activity in this field. Several of the leading Schools of Public Affairs and Public Administration are particularly competent and interested in developing or expanding programs in this area. Jointly with the Council of State Governments, the National Association of Schools of Public Affairs and Administration stands ready to contribute its resources toward the achievement of the objectives outlined in the following Report.

I wish to express my personal appreciation and that of NASPAA to the editors and contributors of this Report, Dr. Albert H. Rosenthal, Dr. Robert Wilcox, Dr. Frank Marini, and Mr. H. Clyde Reeves of the Council of State Governments. We are grateful to the National Science Foundation for the grant which underwrote the conduct and publication of this study. We are indebted particularly to Messrs. Frank Hersman, Clarence Ohlke, Robert Crawford, and Rich Stephens of the National Science Foundation who provided guidance and stimulation throughout the course of the project.

CLYDE J. WINGFIELD

President, NASPAA, and
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ABOUT THE AUTHORS

Dr. Albert H. Rosenthal

Director and Professor, Division of Public Administration since 1968, and Director, Program for Advanced Study in Public Science Policy and Administration, University of New Mexico, since 1969. He received his doctorate in Government at Harvard in 1949 and an honorary doctorate of laws from the University of Denver in 1973.

His career represents a unique combination of both the teaching and practice of Public Administration. He served as an official with the Social Security Board, the Department of State, and for 13 years as Regional Director of DHEW in Denver. In 1970-71, he served as Head, Office of Public Understanding of Science, National Science Foundation. He was Director and Professor of the Graduate School of Public Administration at the University of Denver and Professor of Public Administration at the University of Minnesota prior to coming to the University of New Mexico. He is the recipient of the Rockefeller Public Service Award, the Denver Civic Award, and the New Mexico Distinguished Public Service Award.

He serves as a member of the Executive Council of NASPAA, has been Chairman of the NASPAA Science Policy and Administration Committee since 1970, and has served two terms on the National Council of ASPA. He is the editor of a recent book, **Public Science Policy and Administration,** the author of **The Social Programs of Sweden,** and has published numerous articles in this field. He currently serves as a consultant to several federal and state government agencies.

Dr. Robert F. Wilcox

Dr. Robert F. Wilcox joined the faculty of the University of Colorado in September, 1972, as Dean of a new Graduate School of Public Affairs. During the year preceding his arrival in Colorado, Dr. Wilcox had been in Washington, D.C. on an assignment as Head of the Office of Public Understanding of Science of the National Science Foundation. He received the Doctorate of Political Science from Stanford University in 1950.

For some twenty years before going to Washington, Dr. Wilcox had been on the faculty of California State University, San Diego, as Professor of Political Science and later as Professor of Public Administration and Urban Studies. He served as chairman of the Political Science Department, head of the Public Administration program, and director of the School of Public Administration and Urban Studies. In California he was active in public affairs, serving on a variety of consultative and leadership posts in state and local government.

He is currently serving a second term on the National Council of the American Society for Public Administration and in 1970-71 he was president of the National Association of Schools of Public Affairs and Administration. He is a member of the National Academy of Public Administration. He is the author of a book, monographs, and articles, and has contributed chapters to several recent books.

Dr. Frank Marini

Dean, College of Arts and Letters, San Diego State University. He received his doctorate from the University of California (Berkeley) in 1966.

From 1970 to 1973 he was Director of Public Administration Programs and Associate Dean of the Maxwell School of Syracuse University.

He is the editor of **Toward a New Public Administration,** the forthcoming **Images of Classical Democratic Theory,** and numerous articles and reports. He has been Managing Editor of the **Public Administration Review** since 1967, is on the Executive Committee of NASPAA, and serves on a variety of Committees and Boards in the area of Public Administration.

Mr. H. Clyde Reeves

Director, Technical Assistance of the Council of State Governments. He received his Master of Arts degree from the University of Kentucky, and received an MSPA from Syracuse University.

He served as Commissioner of Revenue of Kentucky, Executive Vice President of the University of Alabama for Huntsville Affairs, Professor of Political and Administrative Sciences, University of Alabama in Huntsville, and Consultant to the Advisory Commission on Intergovernmental Relations and the Committee for Economic Development.

I.

Purposes and Methodology in Development of Report

Albert H. Rosenthal

Background and Purposes of Study

On June 22, 1971, the Committee on Science Policy and Administration of the National Association of Schools of Public Affairs and Administration submitted a proposal to the National Science Foundation for the purpose of supporting a "Planning Conference on the Development of University Programs in Public Science Policy and Administration."

The request pointed out that a number of universities are in the process of establishing or extending programs in Public Science Policy and Administration, and that other institutions are seeking to inaugurate programs in this field. These programs, directly related to the interest and concerns of the National Science Foundation, include:

1. The conduct of research on problems of Science Policy and Administration;

2. The development of institutional capacities for work in this field, with particular attention to local, state, and regional based science programs;

3. The utilization of university capacities to provide research and consultative services for state and local science advisory groups;

4. The development of an interdisciplinary curriculum to

   a. prepare highly-qualified young people for careers in Public Science Policy and Administration

b. augment the educational background of mid-career scientists and engineers to prepare for leadership positions in this field;

5. The sponsoring of seminars and colloquiums, bringing together students, faculty, scientists, government leaders, communication specialists, and lay leaders to discuss common problems and concerns in this area; and,

6. The development of appropriate methodologies and programs to increase the awareness of the contributions of science and technology to Society.

METHODOLOGY AND SCOPE OF PROJECT

The original proposal requested modest funds to convene a conference or a series of conferences of members of the NASPAA Science Policy Committee together with key officials to address themselves to four major topics:

1. The ascertainment of needs of federal, state, and local Science Agencies and suggested means by which university Schools of Public Affairs or other Schools or Departments may assist in meeting them.

2. The description and assessment of the several types of university programs in Public Science Policy and Administration and an examination of present needs and future potentials.

3. The role and potential of Schools of Public Affairs, together with other university resources, in providing support for state and local science programs and in developing approaches to widening public understanding of science and technology.

4. The formulation of recommendations and the publication of a report summarizing the findings in the areas outlined above and recommending methods of supporting university programs in this area.

GRANT AWARD

On October 7, 1971, the National Science Foundation approved the proposal and awarded a modest grant for the purposes stated above. On July 6, 1973, the grant was extended to December 31, 1973.

ACTIVITIES UNDERTAKEN

One of the basic purposes of the NASPAA Committee on Science Policy and Administration has been the stimulation of panel discussions in this field at regional and national ASPA conferences. As the direct result of proposals and arrangements by this Committee, four panels were set up for the Regional ASPA Conference held in Las Vegas, Nevada, on October 30-31, 1970. Six panels were set up for the National ASPA Conference held in Denver, April 18-21, 1971. Panels were also planned and conducted for the Regional Conference held in Phoenix, Arizona, on November 11-13, 1971. Significant activity was reflected at the National Conference of ASPA, held in New York City on March 21-25, 1972, where seven panels were conducted in this field. The heads or deputy heads of several major science agencies participated in several of these panels. Six panels in Science Policy and Administration were held at the National ASPA Conference in Los Angeles in April, 1973.

COMMITTEE MEETINGS HELD

Meetings of the NASPAA Committee were held either immediately prior to or during the conferences in Las Vegas, Denver, Phoenix, New York City, and Los Angeles. At each of these meetings attention was given to the topics covered by the NSF Grant.

In lieu of the original plan of convening one large conference on this subject, the Committee, in consultation with interested NSF officials, decided to convene several smaller "working meetings" and to develop for discussion at these meetings the papers and recommendations which would ultimately constitute the Report of the Committee. It was proposed that the Report focus on the observed needs in this field of federal, State, and local government science agencies in obtaining or developing personnel with administrative as well as scientific capabilities and the present resources and developmental possibilities for providing advanced courses for graduate students by several universities to meet the observed needs. Consequently, in addition to the meetings noted above, five special meetings of the NASPAA Committee on Science Policy and Administration have been held to achieve the objectives stated above, as follows:

1. The first meeting was held in Washington, D.C., at ASPA headquarters on December 2, 1971. The NSF Grant provided funds for the transportation of two members of the Committee. At this meeting, preliminary plans and assignments were developed.

2. During the NASPAA Conference in New York City on March 20, 1972, a panel session was presented in which the several types or "models" of programs in Schools of Public Affairs and Administration were presented and discussed. This complemented the panel held during the ASPA Conference later in the week in which leading figures in these fields were asked to discuss the "needs" of public agencies in this area. By this arrangement, several key NSF officials attended and participated in the NASPAA Conference.

3. The third meeting sponsored by the Committee was held in Denver on June 14, 1972. Eight members of the NASPAA Committee, two senior NSF officials, and two advisors attended the Denver meeting. They included: Dr. James Carroll, Ohio State University; Dr. Brewster Denny, University of Washington; Dr. Frank Marini, Syracuse University; Dr. Lloyd Musolf, University of California at Davis; Dr. Frank Smith, University of Houston; Dr. Robert Wilcox, San Diego State University; Mr. Clarence Ohlke, National Science Foundation; Dr. Frank Hersman, National Science Foundation; Mr. John Magruder, Department of Transportation; Mr. Mort Stern, *Denver Post;* and, Dr. Albert Rosenthal, University of New Mexico. Dr. Frank Marini, then of Syracuse University, and Dr. Robert Wilcox, then at San Diego State, presented working papers which were discussed fully and changes recommended by the group. Mr. Clarence Ohlke and Dr. Frank Hersman of the National Science Foundation presented suggestions for further work by the Committee. At this meeting, it was suggested that specific recommendations be formulated and that, because of the series of small meetings held, the NASPAA Committee should now formulate its Report rather than seek to sponsor a larger conference.

4. Immediately prior to and during the National ASPA Conference in Los Angeles, members of the Committee met to review drafts of the Report. Subsequent to these sessions, Mr. Clyde Reeves of the Council of State Governments expressed an interest in exploring with the Council of State Governments its potential for participating in developing the capacity of universities to provide qualified staff personnel and to undertake research projects for state and local science advisory agencies. Members of the Committee and NSF officials who participated in the discussions strongly supported the adoption of this proposal.

5. The fifth meeting was held in Denver, Colorado, August 23 and 24, 1973, as a working meeting of a subcommittee consisting of Drs. Wilcox and Rosenthal and Mr. Clyde Reeves of the Council of State Governments. The subcommittee sought to edit previous drafts of the Report, including decisions made at earlier meetings

of the Committee and suggestions received from Committee members by mail, and prepare an up-to-date draft of the Report.

One of the most significant activities of the Committee, conducted under the leadership of Dr. Frank Marini, then at Syracuse University, consisted of the formulation and circularization of a questionnaire to member Schools of the National Association of Schools of Public Affairs and Administration to determine the "state of the art" and to ascertain quite specifically the resources and interest evidenced by these schools in contributing or in desiring to contribute in meeting the manpower needs of public agencies in the field of science policy and administration. This inquiry and its results have been collated and are described and interpreted by Dr. Marini in Section III of this Report.

While this Report represents the work and thinking of a number of our Committee members and advisors, three members of the Committee, Dr. Robert Wilcox, Dr. Frank Marini, and myself as Chairman, undertook to write specific sections of the Report. The Committee requested that Mr. Clyde Reeves include a section relating to the needs of the states and indicating how the Council of State Governments might participate in the Program to increase the interaction of state governments in science and technology utilization.

The Recommendations have been circulated quite widely in draft form and include the considered views of members of the Committee and other leading figures in science policy and administration throughout the United States.

Significant contributions in the deliberations of the Committee have been made by Dr. Frank Hersman, Mr. Clarence Ohlke, Mr. Robert Crawford, and Mr. Rich Stephens of the National Science Foundation. The several presidents of NASPAA during the tenure of this Committee, Dr. Laurin Henry, Dr. Robert Wilcox, Dr. Morris Collins, and Dr. Clyde Wingfield, have given leadership to this work. Mr. Seymour Berlin, Executive Director of ASPA, and Mr. Don Blandin, Staff Director of NASPAA, have ably provided essential coordination and administrative services.

To each of the participants and particularly to my colleagues, Drs. Wilcox and Marini, and to the National Science Foundation for its interest and support, we are deeply grateful. Dr. Lloyd Musolf contributed particularly to the statement of Recommendations. Our thanks to Miss Betty Wollerman who typed the manuscript and to the University of New Mexico Printing Plant for its publication.

In the succeeding pages, the NASPAA Committee on Science Policy and Administration presents its findings in four major areas:

1. Manpower needs in science agencies of federal, state, and local governments;

2. University resources and needs in providing services to public science agencies at federal, state, and local levels;

3. The interest and role of the Council of State Governments; and,

4. Conclusions and recommendations.

II.

Manpower Needs in Science Agencies of Federal, State, and Local Governments

Robert F. Wilcox

Science policy is concerned with decision-making in the scientific and technological aspects of society's problems. It includes the setting of priorities and the working out of plans for implementing needed action. Administration, in addition to being involved in policy making, emphasizes the effective implementation of plans in such public sector fields as environmental preservation, transportation, housing, energy needs and others, all of which have an increasing scientific and technical input.

The need for education and training in science policy and administration cannot be defined in quantitative terms. Unfortunately, manpower planning is in a backward state in this country, even in such clearly-defined occupational areas as law, medicine, teaching, engineering, and the basic sciences. The marketplace is the principal determinant of demand while universities, in an uncoordinated way, determine the supply. Thus we have no choice but to deal in a general, non-quantitative way with the role of the university.

THE FEDERAL SERVICE

One approach to defining the need for university programs in public science policy and administration would be to tally the number of scientists, engineers, and technicians who hold executive or managerial positions in the federal service but who have had little or no exposure to the study of public affairs. More will be said on this point later. The broad scope of the education/training task is

indicated by the fact that federal expenditure for research and development is on the upswing. It is difficult to discover the trend or note its scope and significance because R & D funding is scattered throughout the federal budget.

Congress and the Administration are supportive of science and technology, particularly in relation to their potential to contribute to solving the problems of society. This support has been manifested recently in the following ways:

1. The present administration is seeking to develop a more strategic approach to our national R & D investment;

2. The FY 73 federal budget seeks to accelerate the nation's efforts to turn science and technology to the service of man through emphasis on solving important civilian problems;

3. A new effort has been proposed to boost federal investment in development of civilian R & D capacity through creative technologies while continuing a major R & D effort in national security;

4. The FY 73 budget proposes an increase of 400 million dollars the first stage of a 2 billion dollar R & D investment over the next five years.

The long-term prognosis is that R & D is here to stay, and that the role of the scientist-executive and engineer-executive in government will become more important. Increasingly, science and technology will touch all aspects of government.

There is additional evidence to be found in several different areas of the federal government. Each major department/agency has a science/technology component, and the title of Assistant Secretary for Science is now a familiar one. The President's Message on Science and Technology, delivered in March, 1972, announced his decision to draw more on the capabilities of the high technology agencies—NASA, AEC, and the Bureau of Standards—to deal with domestic problems and long-range national goals in addition to traditional missions.

The President's message also called on each agency to sponsor research related to its mission and responsibilities and to develop ties with such ultimate users of technology as states and cities. Many former NASA and DoD scientists and engineers are now working for civilian agencies, applying science and technology to urban and environmental problems.

In view of these trends, the universities have a responsibility which has been defined by Dean Don Price in testimony before the House Committee on Science and Astronautics in 1970.[1] Dean Price said, "... To develop this essential connective link between science and

politics, the civilian departments will need support from Congress and the President . . . The departments will have to undertake the slow and painful job of developing staff of this kind. And the universities will need to help, since neither education in the basic sciences nor education in the older approaches to administration is capable of producing the intellectual skills necessary to synthesize the two. These are essentially synthesizing skills, application skills, among career officials in federal departments and agencies."[2]

EXECUTIVE MANPOWER

Unfortunately, we do not have the data we need on the entire federal establishment. Thanks to the U.S. Civil Service Commission, we do know something about the executive manpower structure.[3] We must realize that in looking at federal executives, we are looking at only part of the picture. There are many more managers in grades 13 through 15, than there are in the executive categories, and it would be necessary to do some extrapolation.

The CSC definition of an executive is any full-time employee of an executive branch whose salary equals or exceeds the beginning salary of the General Schedule, grade 16. These are about 11,000—one-half of one per cent—of the total federal civilian employment. The largest single concentration is in Defense, 1,671; NASA, 749; HEW, 576; Commerce, 446; and Transportation, 417. Nearly 50% of the total (46%) are in scientific and engineering occupational groupings—bio-science, physical science, etc.

Well over 50% of scientists and engineers in supergrade positions (GS 16 and above) are managers or supervisors rather than individual workers. Over one-third of scientist and technical positions among supergrades are involved in public issue activities, i.e., carrying out duties in accordance with the program philosophy to top agency management.

The needs of the future, as far as federal executives are concerned, are indicated by statistics complied by CSC. The composite picture of today's federal executive is that he is a career appointee, male, 53 years of age, having 26 years of service, and eligible for retirement in four years. The average age among scientists is 52; sixty-four per cent of scientists are over 50, twenty-five per cent of them were eligible for retirement in 1971, fifty-three per cent will be eligible for retirement by 1976. Clearly, a new crop of scientific and technical executives is emerging.

What is the age of appointment to the first executive position? Eighty per cent of scientific executives are appointed at age 40 or

after; 51% at age 45 or after. There is ample opportunity to reach these people after they have completed their professional education and before their appointment to executive positions. Also, there are considerable numbers of scientists in executive positions who continue academic work after entering government service. Forty-two per cent completed some post-graduate work, while 20% received graduate degrees. The pattern of carrying on the educational process is present. It needs more policy/management input.

Evidence of the problem we face in identifying the nature of the public service executive's role is to be found in a study, recently completed by the National Academy of Public Administration, of the conversion of specialists into managers. The universe studied was made up of scientists and engineers in the National Institutes of Health and NASA. Senior management officials were unaware of or tended to ignore the importance of the transition process, the problems associated with it and the importance of relevant training for management, the study found. The authors say: "These data (on performance of management functions) strongly suggest that one of the problems in the transition of scientists and engineers rests in unrealistic opinions and negative attitudes as to the role of management functions in the pool of individuals from which managers will be drawn."[4]

STATE GOVERNMENTS

The federal government, rather than the state, has been the primary user of science and technology in public sector programs. State officials generally have looked to Washington for leadership and assistance when an emerging public issue appeared to require involvement of scientists and/or engineers. The report of a study group on technology assessment had this to say: "This general conditioning over a period of three decades has tended to obscure the importance of the impact of science and technology upon public programs and their processes at the state level."[5]

A finding of this same study group deserves quotation here because it reflects a general attitude which constitutes an obstacle to state government-university relations.[6]

> The general attitude among State officials and the public that science and technology are either irrelevant or beyond the scope of State action has resulted in what some have called the absence of "technological enterprise" in State government. Generally States finance a minimum of research and develop-

> ment to be sponsored or conducted by State agencies. These programs are among the first to be reduced in the annual search for funds to meet the pressing public needs. The States spent a mere $150 million collectively of their funds on research and development in fiscal year 1970—less than one per cent of Federal expenditures. The results of Federal research projects appear to be untapped by State agencies. What is missing in most States is the formal structure and the institutional arrangements to support inter-agency cooperation and coordination, and to facilitate more productive liaison with Federal agencies. Even where science advisory or coordinating mechanisms are active, they do not receive either the political attention or the support that could make them more effective.

Fortunately, William D. Carey has made a recent study of relationships between state governments and state universities. His work was done in connection with a comprehensive survey made by the Council of State Governments on the role of technology in meeting state and local needs. This section of the paper is based largely on Mr. Carey's study and quotes directly from his report.[7]

As the new federalism gains momentum, a number of "how to do it" questions are beginning to confront the states in public finance, economic research, planning, and a number of other fields. States are in need of qualified scientific and technical advisors in order to help them make choices. They can employ individual experts, go to outside consultants or look to the university's resources.

Mr. Carey points out that ". . . as a rule, however, state universities are given low marks by officials in weighing their contribution to the practical problems of governance." This generally negative view is understandable since the basic university mission is not oriented to problem-based, quick-response technology. Preferences of faculties are not easily organized for action. As Mr. Carey points out, ". . . The incentives and rewards for performing public service roles are frequently absent or slight."

Generally, according to Mr. Carey, state officials can be dubious of the value of university research.

> . . . The present governor of Connecticut on taking office terminated a State Research Commission. His objectives were eminently pragmatic: to strike at the state's unemployment problem and to stimulate industrial innovation. The fault of the defunct Research Commission, in the Governor's eyes, was its preoccupation with research, "without regard to whether or not that research resulted in a boost to Connecticut's industry."

Turning to the potential of state universities, Mr. Carey said the evidence supports a judgment that:

> . . . the state universities have a major potential to bring applied science to the service of state governments, and that this potential is not being tapped effectively. Throughout the country, universities are struggling to find the resources to set up interdisciplinary centers to focus on a spectrum of public problems. There is a new orientation toward the idea of the university as a problem-solver, an institution which is concerned with the delivery of knowledge to users. How firmly committed they are as institutions is uncertain. Teaching is still the *primary* mission of the university; the public service role is subsidiary and fragile.

Among Mr. Carey's recommendations, the following are most significant for our purposes:

First, there is a need for bridging institutions, such as Public Technology Centers ' to focus public 'seed money' upon the integration of university, industrial, and governmental skills in applying public technology to critical needs of state government." Second, state legislatures should recognize and legitimize the consultative function of the state university faculty. Third, states should look at the basic charters of their institutions of higher education for the "purpose of strengthening their public service roles and missions, and to include protections for faculty members against sanctions or loss of preferment as a result of participation in matters of public policy or controversy at the request of any agency of state government."

LOCAL GOVERNMENT

Local government holds great potential for a significant university role in science policy and administration. Individual urban problem areas to which science and technology can contribute are as follows:

Environment—Air, noise, and visual pollution, poor land use.

Economy—Lingering recession and associated unemployment, declining basic industry.

Health—Poor distribution of health and medical facilities, rising costs, widespread public dissatisfaction, the scandal of the municipal hospital in such localities as New York and Washington.

Housing—The discrepancy between demand and supply, increasing costs and use of outmoded techniques.

Water, Power, Energy—Wasteful consumption leading to scarcity and shortages.

Transportation—Use of a single mode of transportation, the automobile, which defeats the need for mass transit.

Other examples can be cited in education, communication, and even in the operation of local government itself. However, the relationships and interactions among these components of the urban system seem to be inadequately understood by researchers and program people alike. There is little understanding of the *urban system*, the interrelationships of its component parts, because each problem is attacked by specialists. Similarly, there is little recognition of many of these serious problems on the part of the general urban public or of the interactions and interfaces between components. Aside from air pollution, relatively few members of local communities are particularly concerned with environmental problems. Most disturbing, though, is the fact that little effort or progress has been made toward correction on the part of local and regional government. Aside from some air and water pollution improvement efforts, not many improvement programs are underway in the problem areas.

A survey of science-technology advice in local governments indicates a potential opportunity for university faculty, provided that they can be more persuasive than they have been in the past in their dealings with local government officials.[8]

> . . . the cities claim their need for advice is great in the field of environmental pollution control, underscoring the important role which biologists, geologists, and chemists should be playing in local government. This would indicate that if cities cannot employ individuals in these professional fields, they must rely on outside sources whether they be science advisory units, consultants, or state or federal agencies, for advice in functional areas such as environmental pollution control.

Few criteria or guidelines have been developed for rank-ordering priorities in the attack on urban problems, assuming there is a will to attack them. Both elected officials and career executives are reluctant to adopt innovative procedures or attempt to implement improvement programs when there are large uncertainties as to impact on other problem elements or areas. The element of potential risk is great. We may ask why research and development should be undertaken when implementation is highly doubtful.

Research, except in a few highly specialized and highly focused areas such as health and traffic safety, is not considered to be a

function of local government. Typically, no such item as research appears in local government budgets. They don't do research (although some is bootlegged by federal funding) because it is not considered to be a legitimate function of local government. Local governments do not feel they have the resources to devote to research and development.

Fortunately, there is research on local problems, such as that of the Urban Observatories, but there is evidence that much of the research effort currently undertaken on many urban and societal problem areas consists of that which scientists and researchers find challenging, and also will further the body of knowledge and be publishable, i.e., academic research. Relatively little of this research can be utilized in the search for practical solutions to the very real problems of urban governments. For the most part, university researchers are not those who have a commitment to and understanding of local government.

What is the role of the university in science policy and administration relating to local government? Its role is to build bridges, as in the case of state government, to encourage faculty participation, and make it easier for them to work with local government. There must be an agency in the university to take care of the involved paper work in drawing up contracts and meeting the varied logistical requirements of a research or consulting project. Even more important is the task of education. The university should build awareness on the part of local elected officials and top career management people of the potential of science and technology to assist in the solution of problems. Educational programs would encourage in-house research in local government, with consultation provided by university faculty. Bringing local government people onto the campus would expose them to interdisciplinary workshops and symposia and increase their sophistication in science and technology.

The most compelling argument on behalf of the School of Public Affairs/Administration is that it is the one interdisciplinary program on the campus with an orientation to the public service. It is the one turf on which specialists can meet and bring their expertise to bear with a problem orientation or focus. The faculty members of such schools may be specialists by training and in their interests, but also they are generalists, interested in working across boundaries and in applying varied knowledges to specific problems. The School of Public Affairs is the only agency in the university that can perform the very necessary broker function in science policy and administration.

Footnotes

[1] *National Science Policy*, hearings before the Subcommittee on Science Research and Development of the Committee on Science and Astronautics, U.S. House of Representatives, 91st Congress, 2nd Session, U.S. Government Printing Office, Washington, D.C., 1970, p. 12.

[2] *National Science Policy*, *op. cit.*, p. 16.

[3] Bureau of Executive Manpower, U.S. Civil Service Commission, *Characteristics of the Federal Executive*, Washington, D.C., November, 1969; see also Nicholas J. Oganovic and Harold H. Leich, "Human Resources for Science Administration," Chapter 3 in Albert H. Rosenthal (ed.), *Public Science Policy and Administration*, University of New Mexico Press, 1973.

[4] James I. Bayton and Richard L. Chapman, *The Transformation of Scientists and Engineers into Managers*, The National Academy of Public Administration, Washington, D.C., June, 1971, p. 42.

[5] *Technology Assessment in State Government*, A Report on a Working Conference and Recommendations for Action, National Academy of Public Administration, Washington, D.C., September, 1972, p. 16.

[6] *Ibid.*

[7] "A Stronger Role for State Universities" in *Power to the States, Mobilizing Public Technology*.

[8] Urban Data Service, International City Management Association, November, 1970, Vol. II, p. 31.

III.

University Resources for Science Policy and Administration

Frank Marini

Two important trends are underway which taken together constitute the catalyst for the concern of this committee. On the one hand, there is an increasing recognition of the need for quality training for the public service, high-level education and research for the solution of public problems, and better education in public affairs generally. On the other hand, there is an increasing recognition that developments in science and technology—and the social impact, promise, and problems of these developments—are very inadequately understood. When these two trends are perceived together it is logical to ask how they might be related and what might be the most fruitful relationship between developments in education for Public Affairs and developments in the realm of science and technology.

RECENT DEVELOPMENTS

There are recent developments in science and technology which are directly related to the developments in Public Affairs education. Among these are:

1. There is a growing belief that much of the *knowledge, technology, and science which is needed as graft or nutrient to a stronger, healthier Public Affairs educational enterprise is already in existence* and that the main problems have to do with

   a. "packaging" and "delivering" knowledge from one sector to the other;

   b. developing the linkages between sectors of knowledge so that the relevance of matter to be transferred may be noticed; and,

c. developing structures, roles, and behavior patterns in and around the world of Public Affairs education which facilitate truly interdisciplinary problem-oriented cooperation.

2. In a closely related point, there is growing belief that there is a paradoxical relationship between many of the problems of our society and the area of science and technology. *whereas some of our public problems ought, it seems, to be capable of amelioration by developments in science and technology, it also seems that some of them are caused or aggravated by developments in science and technology.* There are a variety of responses to the paradox, but the one that most interests us here is the growing awareness that somehow the world of technological and scientific enterprises must be linked more closely to that of Public Affairs education.

3. Increasingly, it is realized that *technology transfer must involve developing a capacity at all levels of of our federal policy to understand and employ technology* in the solution or amelioration of public problems.

4. A direct implication of the above point is that *public administrators and policy makers at all levels of government must be trained and educated in ways that make them sensitive to the opportunities of technological developments and in ways that enable them to assess and to employ technological knowledge.*

WHAT IS THE ROLE AND POTENTIAL OF SCHOOLS OF PUBLIC AFFAIRS IN MEETING ASCERTAINED NEEDS IN THE AREA OF PUBLIC SCIENCE AND TECHNOLOGY?

A significant question which concerns us here may be stated as: "What is the role and potential of schools and programs of Public Affairs in meeting needs in the area of public science and technology?" The committee has attempted to articulate *some* models which indicate possible contributions of Public Affairs schools and programs to the needs of public science and technology. Some of these models are taken more or less directly from descriptions of currently operating programs, some are extrapolations of ideas which we know are being tried, and some, to the best of our knowledge, are "made up" (though the "made up" ones are, in the nature of things, mostly constructed of components and themes which have been encountered somewhere). In committee discussions we found ourselves focusing on those experiments and models which committee members had personal experience with or knowledge about, and we wondered whether this was a limitation or distortion worth troubling about. This has been discussed in committee and in a variety of

meetings with individuals from the wider public affairs community. The advice we have received and the conclusion we have reached is that the committee need feel no obligation to deprive itself of the experience of its members and that we ought to discuss the possibilities and models from the base of our best knowledge. Nevertheless, the committee decided to circulate a letter of inquiry to all members of the National Association of Schools of Public Affairs and Administration in order to have some knowledge of the organizational rudiments and direction of programs in the area of Science and Technology within member institutions.

Replies were received from twenty-two institutions. We have grouped these institutions into three divisions: (1) Public Science Policy and Administration Programs; (2) Minimal Public Science Policy and Administration Program; and, (3) No Public Science Policy and Administration Program. We may briefly indicate the information gleaned about institutions in each of these groups:

1. *Public Science Policy and Administration Programs* (defined as: schools or programs which offer a number of courses in this area and/or have relevant graduate fields of specialization)

Seven institutions have Public Science Policy and Administration programs. Within this group:

a) *Six* indicated specific units related to this area of study.

b) Of the *five* which indicated the type of training, *three* were primarily pre-service, and *two* were in-service.

c) All *seven* institutions indicated that they would expand in this area if additional funding were available.

d) All *seven* institutions indicated that they would expand research efforts, especially in areas such as: technological assessment in the energy area and in bio-medical fields; evaluative research on existing programs for providing science/technology advice to policymakers: case studies on successful innovations in NASA, DoD, etc.; management approaches to grants; and, social management of technology.

2. *Minimal Public Science Policy and Administration Program* (defined as: has offered course work, has had faculty research in the area, and/or has students interested in the area)

Seven institutions have some involvement in Public Science Policy and Administration, but their involvement is considerably short of a program in the area. Within this group:

a) *Two* have a unit directly related to Science Policy and Administration in some unit of the university (but not in the Public Affairs or Public Administration unit).

b) *Two* indicated that their involvement is primarily pre-service

training; *two* indicated that their involvement is both pre-service and in-service training; and *three* offered no indication of type of program.

c) *Three* indicated recent research activities, and indicated a desire to expand this research activity if funding were available.

d) *One* indicated that it would not be expanding in this area even with funding; *four* indicated that funding would enable expansion and development; *one* indicated a significant possibility for reduction in the existing program.

3. *No Public Science Policy and Administration Program*

Eight institutions indicated that they have *no program involvement in this area. Within this group*:

Two indicated the possibility of developing such involvement, especially if funding became available; *one* indicated that it would not develop in this area due to other priorities; and *five* gave no indication of intent.

GRADUATE PROGRAMS IN PUBLIC AFFAIRS

A School or Program of Public Affairs can respond flexibly to the needs of science agencies through mid-career programs which are organized in traditional program and semester sequences or through a variety of specially-designed "short courses," programmed learning packages, telecommunications and magnetic recording teaching, flexible learning modules, etc.

"Model A" represents a "typical" School of Public Administration or Public Affairs which emphasizes graduate programs for students coming directly from the completion of undergraduate degrees, majoring in Political Science, Economics, or Business Administration.

"Model B," below, represents a program which mainly delivers advanced public administrative knowledge to those whose backgrounds are principally technological and scientific; if the "comprehensive school" model were to have as a component the essentials of "Model B," it would be responding appropriately to this aspect of the mid-career need as it relates to science and technology.

The other mid-career educational delivery opportunity—delivering relevant technological and scientific knowledge to those already experienced and educated in public administration—is in many ways the "mirror image" of "Model B," but it is different enough so that a discussion of it may indicate something of the usefulness of non-traditional educational formats. In its consultation activities, a school or program of Public Affairs could be expected to encounter specific needs in specific agencies which could be responded to by technological or scientific knowledge. The mid-career educational

delivery of the school or programs of public affairs could consist of training sessions at the work place, specially designed evening or weekend sessions, intensive sessions of a week (or as many weeks as are needed and can be spared from the regular job), semester or year-long training in regular courses or specially designed courses, etc. Some universities offer credit-bearing courses which utilize spaced three-day weekend sessions (usually eight hours a day on Friday, Saturday and Sunday once a month or so) for the educational needs of public administrators who are employed full time. One School of Public Affairs has responded to the training needs of the staff of a public seaway project by designing intensive courses which are taught during the months when the seaway is frozen. Still other schools and programs of public affairs offer numerous "intensive semester" courses regularly. Although such courses are usually designed for specific training needs rather than degree purposes, in most cases they can be utilized to achieve a degree while improving one's job capacity. Although most courses such as these have been developed to deliver public administration knowledge to specialists of one kind or another, there is no reason why schools and programs of public affairs and administration (in cooperation with other university units, especially Engineering and Sciences) should not utilize the same educational packaging and delivery systems to supply technological and scientific knowledge to public administrators.

Set forth below are summary descriptions of four different models or formats of public affairs programs which can contribute to the study of public science policy and administration.

MODEL A: Comprehensive Schools of Public Affairs and Public Science and Technology

It is useful, when discussing optimal Public Affairs education, to focus upon a model extrapolated from the handful of so-called "Comprehensive Schools of Public Affairs (or Public Administration)." Not all valuable programs will be situated in such schools. As a matter of fact, specifically-targeted programs perhaps will be as profitably undertaken at schools which do not aspire to be "comprehensive"—the virtues of the smaller programs lie chiefly in enhancing flexibility of experimentation and variegation of our experience in Public Affairs Education. A comprehensive school could be organized in any number of ways. For example, the School of Public Affairs might have some of the social science departments of the university within it, it might have departments within it which duplicate departments within the wider university, it might have some social science departments within it and some elsewhere in the

university structure, or it might have an interdisciplinary faculty not divided into departments and standing apart from the departmental organization of the rest of the university—other arrangements can also be conceived. The comprehensive School of Public Affairs could readily include a program in Science Policy and Administration, staffed by several faculty members particularly qualified in this field.

The "umbrella degree" in such a School would probably be the MPA, though at some schools there might be a variety of related Masters programs such as Masters of Urban Affairs, Masters of Public Policy Analysis, etc. The usual basic requirement is that students take certain analytical tools and that they choose from a "Chinese restaurant type list" to make up a core of Public Administration courses. The student may emphasize a specific function, jurisdictional level, or problem area, even in the selection of courses (by going heavily into, say, budgeting and quantitative analytical techniques, while taking the minimum in other core areas). In a 40 hours Masters, for example, a student might have 16 credit hours to "specialize" over and above whatever specialization he has worked into his core. For an MPA student with a science and technology interest, these 16 hours could be used to build understanding in the area of science and technology. Such a student would presumably also be encouraged to direct selection of core courses toward his specific objective (e.g., managing complex technological projects; working on problems at a local government level, etc.). There is nothing to prevent a student from combining a Metropolitan Studies, Urban Transportation, Urban Planning, Health Delivery Systems, etc. program with the science and technology program. The implications for "transfer"-relevant training are obvious.

MODEL B: A Program for Advanced Study in Public Science Policy and Administration

(Based on the design of the University of New Mexico Program for Advanced Study in Public Science Policy and Administration)

This program focuses specifically on the need for *advanced interdisciplinary* training for upper mid-management people who have been trained in technical or scientific fields. In principle, the same model could be adapted to deliver technical or scientific expertise to mid-managers who were trained in some other field (say Health Planning) when the technical developments could profitably be transferred to the field in which the manager is presently working. The important thing about programs such as this is that they must be designed upon a clear perception of the needs and they must have a "self-correcting" capacity or a "live link" to the area and agencies for

which they are attempting to train. The program which is serving as this model has a built-in linkage to relevant agencies which helps insure "relevance" in curriculum and research topics.

Program Objectives: The program has two specific objectives:

(1) On the basis of graduate research to add to , and make readily available, an additional body of knowlege concerned with the formulation and administration of public policy in the field of science; and,

(2) To develop and provide a graduate-level interdisciplinary curriculum and research program in Public Administration-Science, leading to the Master of Arts degree.

In an effort to make sure that the efforts in pursuit of these objectives had "real world" relevance, the program was designed with extensive consultative processes with relevant agencies. The consultative processes, resultant curriculum, and organizational structures may be detailed as follows:

Three types of consultation were undertaken to obtain information concerning real-life needs and problems on which to develop the curriculum. These include:

(1) *Consultants:* A number of visiting consultants were brought to the campus for periods of two to five weeks to advise on various aspects of the curriculum.

(2) *Questionnaire.* A research program was undertaken by the U.S. Civil Service Commission, in cooperation with the University and included the dissemination and collation of a questionnaire sent to some 400 practicing science administrators. Among the questions asked were: "What courses in your formal academic training have helped you the most in your present post?" and "What courses taken in your formal academic work would have helped you the most in the successful accomplishment of your present duties?" The answers to these and other questions were collated and served to guide in the development of the detailed curriculum.

(3) *Regional Advisory Committee:* To involve the major science agencies in the region and to obtain continuous counsel in the development of the program from leading science administrators, a Regional Advisory Committee was established, composed of the heads and deputy heads of the major science agencies in the region. At each meeting of the Regional Advisory Committee, a distinguished speaker has been asked to talk on some phase of Public Science Policy and Administration. In addition, the curriculum being followed is presented and consultative advice is obtained from the members of the Committee. At several

meetings, the current Fellows in the program have been invited to attend and participate in the discussions. Members of the Regional Advisory Committee have been available individually to serve as lecturers and have provided frequent suggestions and advice concerning the curriculum.

CURRICULUM

On the basis of the consultation outlined above, the specific curriculum for a two-semester Masters program has been developed.[1] The curriculum is fairly tightly constructed; it includes courses in the functional areas of administration (budget, personnel, organization and behavior), public science policy and administration, research methodology and research project, and an elective course which may be selected from anywhere in the university's offerings. The curriculum is interdisciplinary in design and is taught by an interdisciplinary and interschool faculty.

Each student is required to select and initiate advanced research on a specific topic in the field of Public Science Policy and Administration. The research project culminates in the thesis required for the Master of Arts Degree. The topics range from "Roles of Scientists and Universities in Research and Development Contracting," to "Lateral Organization Patterns in Science Agencies."

STRENGTHS OF SUCH A PROGRAM

The program which provides the basis for this model has been in operation for over five years at this writing.[2] These years of operation have provided clear evidence of the need for this type of program. The participation by agencies which, even during tight budget years, have found it possible to send participants to the Program at the cost of full salary and, in some cases additional expenses, provides testimony of the usefulness of the Program. The active participation of members of the Regional Advisory Committee and their enthusiastic support of the Program further testifies to the need and importance of this type of educational activity.

The interdisciplinary nature of the program is—as is true with most Schools and Programs of Public Affairs—one of its strongest points. The provision of courses cutting across department and school lines affords a much closer "match" to the real-life needs of the government agency at federal, state, and local levels. Since most of the participants come with advanced degrees and expertise in one of the fields of science or technology, the interdisciplinary program affords

supplement to their education in the Social Science and Administrative areas.

Since the Program seeks to prepare people for top posts in the future, the value of advanced graduate courses in the Program is evident. Most of the participants are selected by their agencies on the basis of evident ability and performance on the job in their technical and professional fields. The "track record" indicates that most employees are advanced to higher, more responsible positions following the successful completion of the Program.

The evaluative feedback from former Fellows, their supervisors and agencies, has been particularly helpful. The close and continuous link of the Program with its "clientele" and relevant agencies is among its strongest points.

This, then, is Model B—an educational program focusing specifically upon the advanced educational needs of those who are already in roles in Public Science Policy and Administration agencies.

MODEL C: A Program for Specific Technology Transfer

In general, any particularly desired technological transfer could be used to design a program and the idea is transferable from one particular policy or problem focus to another. In the description of this model, the transfer of technology to deal with urban problems is discussed for several reasons: 1) similar to the earlier argument in favor of focusing first on "comprehensive schools," there is a sense in which something so broad as "urban problems" encompasses or allows one to easily see the relevance of more specific problems such as transportation or health care delivery; 2) the "urban transfer" idea has been discussed and tried at a number of institutions; and, 3) there has been a great deal of talk about the desirability of technological transfer to deal with urban problems.[3]

This sort of "transfer" program should have the same basic elements as most university programs: a research component, a training component, and a consultative component. All can take the "problem solving" mode.

The *research function* of such a program should specifically deal with likely "transfers" and "follow up" on transfer-potentials discovered in the training function. Let us speculate as to a few research questions: Is there a likelihood that urban housing or urban transportation problems are amenable to any of the problem-solving techniques or technical developments, inventions, and apparata of the "space industry"? Is there a likelihood that packaging, delivering, etc., developments in various biological-medical research efforts can be brought to bear upon health care delivery problems? A medical

doctor of some renown has described his rather fortuitous acquaintance and later collaboration with a petroleum engineer which led the two to collaborate in critical areas where the human body and components of oil pumping apparata are alike—can we make such collaboration more likely and more collaborative? There is an order of questions which can easily be overlooked. These are questions as to how interdisciplinary collaboration can be encouraged, what makes transfers "work," what arrangements facilitate the imaginative "transposition" which is part of the transference creativity, etc. These, and many more, are the sort of questions upon which collaborative teams of diverse backgrounds ought to be encouraged to work.

The *training function* of a "transfer" program is supportive of the research function in a variety of ways. An easy way to conceptualize the training function in this kind of program is to assume that the student "intake" is primarily those highly trained in a technical or scientific field (say, aerospace engineers), or individuals who have acquired an advanced degree in some scientific or technical field, or individuals who have acquired a sophisticated understanding of some technical or scientific field. A part of a program which might fit the model under discussion has been described thus:

> the first five students in such a program, all of whom had masters degrees in science or engineering, spent eighteen months working with the county manager and his department heads. . . . The students were judged by the university on their ability to transfer technology into appropriate parts of the county administrative structure. Their dissertation basically was an account of how they did this, the problems they faced, etc.[4]

It was indicated earlier that the output (reports back to their academic programs, dissertations, etc.) of such a student assignment is a valuable input into the research-consulting function of the enterprise. But consider also the other advantages: understanding of "relevance" is in a "face-to-face," common problem-solving, on-the-job situation. Not only would the student gain some insight into what his technical training would have provided him with for making many problems disappear, but also the county administrators and employees with whom he worked would come to a better understanding of the potential and limits of technical skills and apparata.

The *consultative function* of a "transfer" program would work in the way suggested by the training arrangement just described and by earlier remarks about consultative linkages between university units and governmental agencies. It is likely, moreover, that a transfer program, if it were given a chance to build and define itself, could perform a function similar to that a county agricultural agent

performs with reference to his particular "transfer-research-consultation" function. Such a program—as with those discussed earlier—would be the "point of first contact" with the university community for governmental actors and agencies with problems.

MODEL D: A "Close the Culture Gap" Program

In correspondence cited earlier, Richard E. Stephens pointed in the direction of "Model D" with these words:

> It seems to me that one of the real contributions that schools of public affairs can make in the application of science and technology is to help breach the so-called "two cultures" gap. By this I mean we need to find ways to give the prospective public administrator and the politican a better appreciation of the contributions of science and technology to society and the limitations therein. Administrators, particularly in local governments, need to know more about the behavioral makeup of scientists and engineers. For example, how do scientists do their "thing"? What motivates them? What are their biases, favored approaches, predilections? What does it mean when a scientist says something is "technically feasible"? We must find ways to familiarize both the scientists and administrators with each other's behavioral environment; call it sensitivity training if you will. The best way to start this acculturation is when both are still in school, but this certainly could be part of a midcareer program. The purpose here is certainly not to educate each in the fundamentals of the other's discipline but simply to throw some light on the landscape.

The felt need to close the "two cultures gap" is frequently expressed and one approach to this need has been mentioned above under the discussion of the undergraduate interdisciplinary functions of the comprehensive school model. The "closing of the gap" task, though, in many ways is the most complex (and perhaps the most important) of the various tasks discussed for programs thus far. The problem is not simply to take the technically-educated person and educate him in the humanities and social sciences (and the other way around), but runs deeper than this into one of the main (and most neglected) educational roles in a society such as ours.

Many undergraudate students are exposed to a sequence of courses entitled "Introduction to Humanities," "Western Civilization," or some such, and some never recover from such exposure. Frequently, the faculties of Art, Literature, History, Music, etc., all work hard at these courses. Students do not become artists, but they

can become acquainted with some broad concepts, history, and meaning in the Humanities. Later, they may neglect this aspect of life and creativity, but they know it's there, understand something of why it is important, and presumably know that they are neglecting it. It may be that something like this "general introduction" into the area of Science and Technology is needed for every undergraduate student.

In the memo cited earlier, Norman Balbanian eloquently expressed some of the rationale for this type of a program.

> We live in a complex, interdependent, technological society. The improvements which technology has made in our collective capacity to cope with our natural environment are surely beyond measure. Nevertheless, in the minds of many today, the adverse effects of technology on our social and physical environment are beginning to counterbalance a significant share of its benefits. No one will deny that our society today is faced with a growing number of severe dilemmas in which technology is heavily involved. If we are to find creative solutions to these dilemmas, then one of the necessary conditions is that our educational system must produce individuals capable of understanding both their socio-political and their scientific-technology sides.
>
> Our educational system in the past has been quite successful in producing many categories of specialists—economists, engineers, biologists, political scientists, nuclear physicists, sociologists—who have carried the development of their professions to high levels of competence and specialization. Yet, if one looks at the integrated effects of their accomplishments, one sees, along with the salutary, such disastrous consequences as the destruction of the natural environment, the growing devastation of war, and—in the midst of material affluence—a gradually deteriorating quality of life.
>
> The traditional education of engineers has prepared them to develop and produce technological products and processes, without acknowledging responsibility for possible harmful consequences for the environment, or for social, political, and cultural impact. At the same time, most non-engineering higher education has managed to avoid the introduction of much technological content, leaving otherwise well-educated persons more or less illiterate with respect to technology. One consequence of this is a growing fear, particularly among humanists, of approaching "technocracy"—a political system in which nominal decision makers are unable to understand sufficiently

the technological content of issues and hence must refer political decisions to technical (non-accountable) specialists.

The other points to which Richard Stephens and Norman Balbanian allude are also important. Cooperative programs across the "two cultures" barrier must be encouraged. There is no necessity for developing such a program within a school of public affairs, but there are considerable advantages to such an arrangement or to an arrangement which involves schools and programs of Public Affairs in an interschool program in this area. A fair amount is being developed along these lines; but surely more is needed.

CONCLUSION

A sketch as brief as this can hope only to point to some of the tasks a school or program in Public Affairs can do in the area of Public Science and Technology. Much more can be developed within such schools and programs which would be related to the needs outlined earlier in this report.

It is clearly the unanimous and considered belief of the members of the NASPAA Committee on Science Policy and Administration and of the NASPAA Executive Committee, that the Schools of Public Affairs and Administration are both willing and able to respond to meeting the manpower and research needs of public science agencies at federal, state, and local levels. As indicated in the concluding section, Recommendations, the major needs are those which call for adequate and long-range financial support to provide the means of developing the faculty and related resources essential to the conduct of an effective advanced educational program.

FOOTNOTES

[1, 2] For further information, see pamphlet, "Program for Advanced Study in Public Science Policy and Administration," University of New Mexico (latest printing, March, 1973), available at the Division of Public Administration, University of New Mexico, Albuquerque, New Mexico, 87131.

[3] A *caveat* should be recognized. The assumption that technology is *the* solution for any urban problem is probably naive or too narrow. Therefore, to jump to the conclusion that a 90-day cram course in urban problems will serve to convert a current surplus in technological expertise (say an aerospace engineer) into a purveyor of meaningful solutions to urban problems is probably unwise.

[4] Letter to Frank Marini from Richard E. Stephens, Program Manager, Office of Public Understanding of Science, dated June 5, 1972, describing a program at the Drexel Institute of Technology, Philadelphia, Pennsylvania.

IV.

Combining Resources to Meet Needs: State Government-University Interaction in Science and Technology

H. Clyde Reeves

Director of Technical Assistance
Council of State Governments

No one knowledgeable about state government would overlook the importance of science and technology in providing necessary information for informed policy decisions by governors and state legislators. With increased interest in the environment and, at the same time, the necessity for growth and employment needs in many areas, the significance of strengthening state resources in this field has become critical.

A real contribution to meeting this need has been provided by the National Science Foundation in stimulating and supporting the development of state and local science advisors and advisory bodies. However, an important ingredient and linkage have been missing. This grows out of the fact that in most areas, there is not an organized capacity established in universities to provide qualified staff, research, trained and knowledgeable personnel to provide the support for the state and local science advisory bodies. Even in those cases where the capacity exists, there is needed an organization structure that is articulated and responsive to meeting state needs.

In many areas, the schools or programs of public administration and public affairs have made a significant contribution in providing young people who are seeking to make state government a career. The university programs have provided essential support for the development and strengthening of state merit systems and in providing essential resources for state training programs to upgrade existing personnel.

Similarly here, the concept of adding to the capacities of university programs in public administration and public affairs in the field of public science policy and administration affords a logical means of meeting state government needs in this area. As indicated in the models outlined above in Professor Marini's paper, several types of existing programs exist in universities throughout the Country. While diversity may be useful in a number of areas, Model B, providing a graduate interdisciplinary course for both pre-service and in-service students and affording ongoing research capacities, appears to meet the needs in most state as well as federal and local agencies.

The wide range of issues in science and technology faced by governors and legislators makes it difficult and prohibitively expensive to build in permanent staff capacity for most state advisory bodies. Issues, ranging from siting of a power plant to the transportation of dangerous substances, face governors more and more frequently.

What is needed is a mechanism which, on an ongoing basis, stands ready to tap existing university resources as needed and make them available, frequently on short notice, to governors and state legislators and their science advisory groups. Knowledge of state and local administrative organization and the decision-making process is imperative here.

These are among the reasons we commend the interest and work of the NASPAA Committee on Science Policy and Administration and look forward to continuing to participate in developing a joint effort by NASPAA and the Council to develop a national program to meet the needs clearly ascertained in the research by this Committee and concisely stated in this Report.

The activities of the Council of State Governments, joining with the National Association of Schools of Public Affairs and Administration, could include efforts to:

1. Articulate both the planning and administration of the program to meet developing state needs;

2. Provide assistance in the selection of advisory committees for the conduct of the program;

3. Provide liaison in building necessary linkages between policy levels in state government and universities participating in this program;

4. Assist in the development of regional and national conferences for the exchange of ideas and the stimulation of program development;

5. Provide information on state manpower needs to universities and information to state governments concerning the availability

of university graduates and faculty resources to meet these needs; and,

6. Participate with NASPAA in the continuous evaluation of program operation and effectiveness.

It appears highly appropriate for the Council of State Governments and the National Association of Schools of Public Affairs and Administration to call on the National Science Foundation, the Environmental Protection Agency, the President's Office of Energy Policy, and other bodies to provide long-term grant support to establish this program as quickly as possible.

The staff of the Council will participate with the NASPAA Committee and officials in preparing and seeking approval of specific grant requests for this purpose.

V.

Conclusions and Recommendations

Albert H. Rosenthal

CONCLUSIONS

As indicated in the section above by Dr. Robert Wilcox, entitled "Manpower Needs in Federal, State, and Local Governments," there is a significant requirement for the preparation of personnel with some scientific or technological backgrounds in the fields of public policy and administration. This need is emphasized in the book, *Public Science Policy and Administration*, particularly the chapter by Nicholas Oganovic and Harold Leich, then key officials with the U.S. Civil Service Commission, entitled "Human Resources for Science Administration: Can Quality be Enhanced?". Oganovic and Leich point out that more than half of all supergrades in the federal service are in scientific and engineering fields and that extensive efforts to provide science-administrative preparation for these key officials are sorely needed.

Present, disparate university efforts to meet these needs have demonstrated the value of focused activity on graduate programs in this field. The National Aeronautics and Space Administration in the late 1960's initiated a program in several universities designed to help meet this need. The elimination of this support has resulted in a sharp decline of university activity in this area. A few universities have maintained reduced programs seeking, in a limited way, to meet needs in this field. However, with sharply reduced legislative support in most state universities and declining enrollments in both public and private universities, only limited university activity is likely unless new federal programs of support are developed.

The recent development of state advisors and advisory bodies in assisting governors and state and local agencies in resolving critical

science policy issues has simply added dramatically to the observed needs. The report, *Power to the States*, published by the Council of State Governments in 1972[1] points out some of the significant challenges and opportunities for progress in state government in this area. Further evidence in this direction is provided in the *Report of the Committee on Intergovernmental Science Relations to the Federal Council for Science and Technology*, issued in 1972.[2]

Dr. Frank Marini, in the section above entitled "University Resources for Science Policy and Administration," provides four "Models" for organization of university resources to help prepare personnel for what Dr. Reuben Gustavson has called "science leadership for tomorrow." Clearly, there is a need and there are both interest and available resources in a significant number of universities distributed geographically across the country to make a contribution in this field. The major issue is how to marshall these resources and articulate them to help in meeting observed needs.

RECOMMENDATIONS

The Committee on Science Policy and Administration of the National Association of Schools of Public Affairs and Administration submits the following recommendations aimed at achieving increased cooperation among all levels of government and the universities in the field of science policy and administration and seeking to organize university resources and interest to provide a more effective method of meeting needs of federal, state, and local agencies working in this field.

RECOMMENDATIONS

I. *Well-trained personnel and effective management of federal programs are vital to achieve the purposes of the public agencies. Accordingly, the attention of the U.S. Civil Service Commission and the Office of Management and Budget should be called to the findings and recommendations of this Committee and leadership by these agencies should be enlisted in the development of new cooperative relationships between universities and appropriate federal departments and agencies in order to advance education and research in the field of science policy and administration;*

II. *The National Science Foundation, as the leading science policy support agency, should be asked to consider the use of existing programs or the establishment of a new mechanism to strengthen*

university resources to help provide well-trained manpower and to conduct relevant research to improve the effectiveness of federal, state, and local science agencies;

III. *The Director of the National Science Foundation, as Science Advisor to the President, should be requested to bring this need before appropriate federal agencies so that they may be asked to use existing programs as appropriate, or to establish new mechanisms by which well-trained people and university research resources may be organized to serve federal, state, and local agencies in the field of science policy and administration;*

IV. *The NASPAA Committee on Science Policy and Administration, jointly with the Council of State Governments, should develop a specific grant proposal for a program designed to meet the needs outlined in this Report and to submit this proposal to the National Science Foundation and other appropriate federal agencies. The pattern of organization and proposed university activities calling for support are outlined in the following pages (Appendix 1).*

FOOTNOTES

[1] *Power to the States—Mobilizing Public Technology* (Summary Report), published by the Council of State Governments, Lexington, Kentucky, May, 1972.

[2] *Public Technology—A Tool for Solving National Problems*. Report of the Committee on Intergovernmental Science Relations to the Federal Council for Science and Technology. Executive Office of the President. U.S. Government Printing Office, Washington, D.C. May, 1972.

Appendix 1

GRANT PROPOSAL

Support of University Programs in
Public Science Policy and Administration

Submitted by NASPAA
Committee on Science Policy and Administration
The Council of State Governments

PURPOSES OF PROJECT

To develop and support university programs located in the several regions of the United States designed to accomplish the following functions:

1. Provide staff and research support for state and local science advisory committees and groups;

2. Conduct research involving faculty and graduate students on a multi-disciplinary basis on facets of Science Administration with particular focus on the relations of Science and Technology to meeting the problems of society;

3. Conduct university graduate programs in Science Administration designed to supplement the professional, scientific, and engineering education of specialists currently in a science agency seeking to prepare for leadership positions in the future;

4. Establish university-sponsored or co-sponsored programs of multi-disciplinary research, conferences, special institutes, and studies seeking to develop a wider public understanding of science and technology; and,

5. Develop university interest and capabilities on a multi-disciplinary basis to provide faculty and student involvement in technology assessment programs.

ORGANIZATION

An Advisory Committee will be established by the National Science Foundation, consisting of three governors, nominated by the National Governors Conference through the Council of State Governments; and three leading figures in science administration and three university officials or faculty members recommended by the National Association of Schools of Public Affairs and Administration. The Advisory Committee will advise the Foundation on such matters as the processes for selection of participating universities, policy issues in implementing the grant, overall supervision of the project and a continuing evaluation of its results.

FINANCIAL SUPPORT AND SCHEDULE

For planning purposes, the NASPAA Subcommittee believes that the following program schedule represents a realistic beginning toward the achievement of the purposes stated above. As indicated below, this development program will be reviewed and evaluated periodically.

It is proposed that the grant for this program be provided along the lines of the following schedule:

First Year

During the first year, 6 universities will each be provided with a budget of $50,000 and administrative funds of $25,000 each will be made available to NASPAA and the Council of State Governments. The major effort during the first year will be for planning and development purposes. — $350,000. per year

2nd-5th Years

This request envisages the participation of 8 universities, including the 6 universities designated for participation during the opening year. The budget for the 2nd through 5th years will include support of $100,000 for each university and $50,000 each for support costs by NASPAA and the Council of State Governments. — $900,000. per year

ADVISORY COMMITTEES

Each university participating will be asked to establish an advisory committee consisting of the heads of science-administrative agencies, both federal and state, located in their vicinity. The advisory committees will review suggested curricula and participate in providing lecturers and opportunities for research.

REVIEW AND EVALUATION

The Advisory Committee will provide for a continuous review of the development of the program and obtain and submit each year to the sponsoring agency an independent "program audit" by qualified non-participating leaders in science-administration.

SELECTION OF PARTICIPATING UNIVERSITIES

The sponsoring agency will be asked to prepare and distribute widely a statement of standards to be used as guidelines in selecting participating universities. Universities will be invited to submit proposals expanding existing programs or developing new programs in this field. Consideration will be given to the needs of state and

local science and technology advisory groups as well as those of federal agencies in selecting the participating universities.

REVIEW FOR CONTINUATION OR POSSIBLE EXPANSION

The evaluation proposed above may be used by the supporting agency in deciding whether to expand the number of universities participating or to continue the program beyond the 5-year commitment. While this review will be made annually, sufficient experience should be obtained by the third year of operation to guide the future development of the program.

Appendix 2

QUESTIONNAIRE LETTER

SYRACUSE UNIVERSITY

THE MAXWELL SCHOOL OF CITIZENSHIP
AND PUBLIC AFFAIRS
SYRACUSE, NEW YORK 13210

OFFICE OF THE DEAN
MAXWELL HALL

October 23, 1972

Dear Colleague:

As a member of NASPAA's Committee on Science Policy and Administration, I have agreed to describe some ways in which Schools of Public Affairs/Public Administration do (or can) relate to needs in the area of Science Policy and Administration. The models of programs in this area which committee members have discussed so far are basically those which are represented at our own schools or about which we happen to know. I would like to expand our information a little beyond this prior to writing our report.

We cannot catalog all relevant programs, but I would like to hear from as many NASPAA members as possible before I attempt to set out different ways programs in our schools might relate to the needs in this area.

In connection with this project, it would be most helpful if you could communicate some brief details of any program in the area of Science Policy and Administration which you have at your institution. The questions in which we are particularly interested are:

1. In what way is your School or Program involved in Public Science Policy and Administration?

2. How is the relevant unit in your school structured and, briefly, what have been its activities in the last couple of years?

3. Is your program chiefly "inservice" or "preservice" in its training efforts?

4. What have been your recent research activities in the area of Public Science Policy and Administration?

5. Would you have reasonable expectations of adding or expanding programs in this area if funds were available? What form would such growth likely take?

6. What sort of research agenda (specific topics) would you like to develop and undertake?

Any additional information you would like to supply would, of course, be helpful. *We have an early deadline on our committee report, though, and information received after November 15, 1973 cannot be utilized.*

Thank you for your assistance.

Sincerely,

Frank Marini
Associate Dean

Appendix 3

*Table of Responses—Frank Marini's Survey of Public Science Policy and Administration Activities of Selected Universities**

	Number of Universities	*Total Number of Universities*
1. Public Science Policy and Administration Programs		7
Specific Programs	6	
1. American University		
2. University of Oklahoma		
3. Princeton University		
4. University of Washington		
5. Syracuse University		
6. University of New Mexico		

	Number of Universities	Total Number of Universities
Pre-Service	3	
1. University of Oklahoma		
2. Princeton University		
3. Syracuse University		
In-Service	2	
1. University of Southern California		
2. University of New Mexico		
Would Expand if Funds Available	7	
1. Syracuse University		
2. University of New Mexico		
3. University of Oklahoma		
4. Princeton University		
5. University of Washington		
6. University of Southern California		
7. American University		
II. Minimal		7
Specific Programs	2	
1. Harvard University		
2. University of Virginia		
Pre-Service	2	
1. Northern Illinois University		
2. University of Virginia		
Would Expand if Funds Available	3	
1. Baruch College		
2. Northern Illinois University		
3. University of Virginia		
III. No Public Science Policy and Administration Programs		8
Possible Development	2	
1. University of South Dakota		
2. San Diego State University		
No Activity	1	
1. University of Nebraska, Omaha		
No Interest	5	
1. Tufts University		
2. University of Virginia		
3. California State University, Chico		
4. University of Illinois		
5. Pennsylvania State University		
		Total 22

*Since considerable time has lapsed since this data was gathered, since many institutions did not respond, and since some of the responses on some items were difficult to assign precisely to one of our categories, the table should be considered as suggestive of the situation rather than definitive.

NASPAA Committee on Science Policy and Administration

List of Members and Locations

1971-73

Dr. Albert H. Rosenthal, *Chairman*
Director and Professor
Division of Public Administration
University of New Mexico

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University of California, Berkeley

Dr. John Brandl, Director
School of Public Affairs
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Dr. James Carroll, Director
Public Administration Program
Maxwell School
Syracuse University

Dr. Morris W. H. Collins, Jr.
Dean, College of Public Affairs
The American University

Dr. Rolf N. B. Haugen
Professor
University of Vermont

Dr. Donald Kash, Director
Science and Public Policy Programs
University of Oklahoma

Dr. Frank Marini, Dean
College of Arts and Letters
Professor of Public Administration
and Urban Studies
California State University,
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Dr. Lloyd Musolf, Director
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University of California, Davis

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Graduate School of Administration
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Graduate School of Public Affairs
University of Colorado

1973-74

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The American University

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Dr. Samuel Humes, Director
Graduate Program in Public Affairs
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